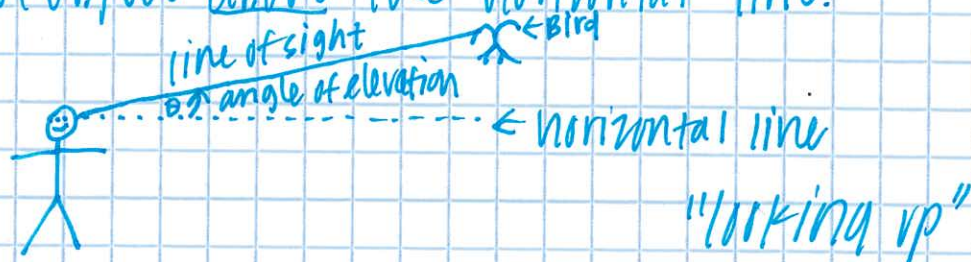
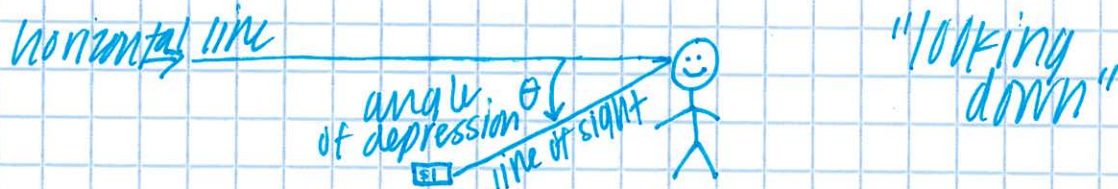


# W#58H- Trig word problems

angle of elevation: angle formed by a horizontal line and an observer's line of sight to an object above the horizontal line.



angle of depression: angle formed by a horizontal line and an observer's line of sight to an object below the horizontal line.



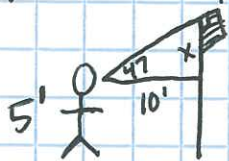
Step 1- Draw a pic (if not given)

Step 2- set up an equation using a trig ratio & solve

Step 3- answer the original question. (w/ units!)

ex) When a 5' tall student is

standing 10' from a flagpole. When she looks up to the top of the flagpole the angle of elevation is  $47^\circ$ . How tall is flagpole?



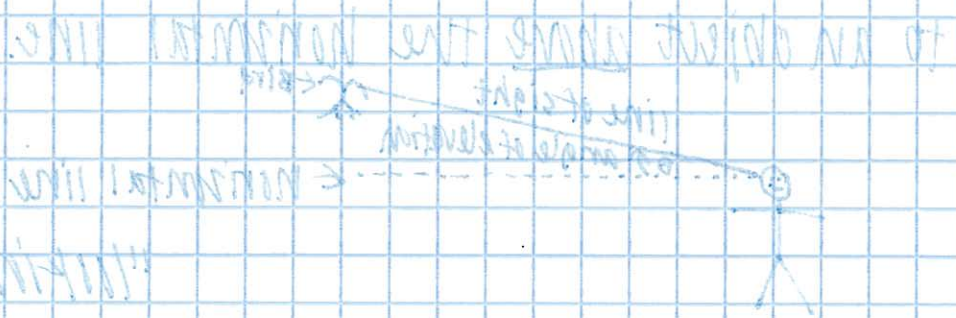
$$\tan 47 = \frac{x}{10}$$

$$x = 10.7 \text{ ft}$$

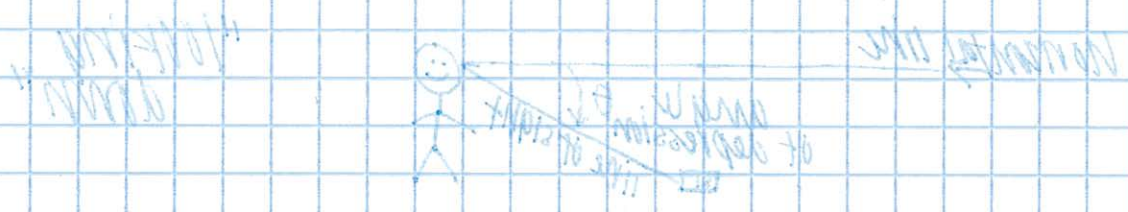
$$10.7 + 5 = \boxed{15.7 \text{ ft}}$$



1. Identify the problem  
 2. Identify the cause  
 3. Identify the effect  
 4. Identify the solution



5. Identify the solution  
 6. Identify the effect  
 7. Identify the cause  
 8. Identify the problem

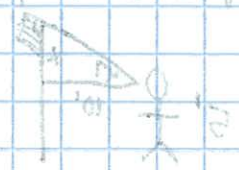


9. Identify the solution  
 10. Identify the effect  
 11. Identify the cause  
 12. Identify the problem

13. Identify the solution  
 14. Identify the effect  
 15. Identify the cause  
 16. Identify the problem  
 17. Identify the solution  
 18. Identify the effect  
 19. Identify the cause  
 20. Identify the problem

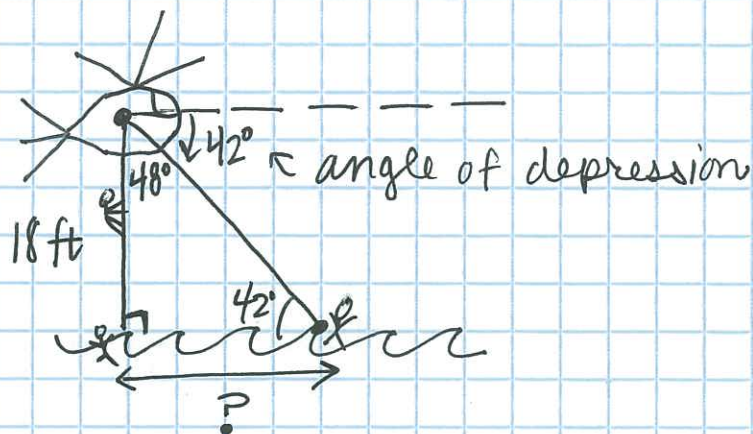
$$\begin{aligned}
 &10.1 + 2 = 12.1 \\
 &12.1 = 10.1 + 2
 \end{aligned}$$

$$\frac{x}{10} = 10.1$$





Ex 2)



two options:

- ① right angle so  $90 - 42 = 48^\circ$
- ② line of sight and horizontal distance are parallel, so alternate interior angles!

opt 1:

$$\tan 48^\circ = \frac{x}{18}$$

$$x = 19.99$$

or 20ish feet away

opt 2:

$$\tan 42^\circ = \frac{18}{x}$$

$$x = 19.99 \text{ or } 20ish \text{ ft away}$$

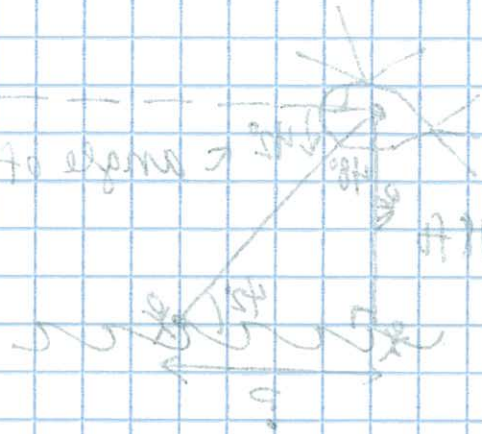
you try:



$$\tan 82^\circ = \frac{x}{18}$$

$$x = 4\frac{1}{2} \text{ ft away}$$

mississippi to edge of depression



(1) X

limiting

① limit of 2000 ft

② limit of 2000 ft

addition to 2000 ft

154

$$\frac{x}{18} = 154$$

154

$$\frac{18}{x} = 154$$

$$18 \cdot 154 = x$$

154

154

154



$$\frac{x}{18} = 154$$

154



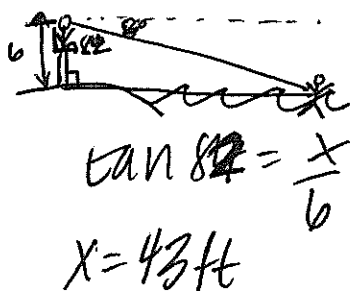
Name: ANSWER KEY TP: \_\_\_\_\_

<b>CRS</b>	FUN 502 Express sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths; FUN 602 Apply basic trigonometric ratios to solve right triangle problems. G-SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
<b>Objective</b>	10.4 Write a ratio for sine, cosine, and tangent when side lengths are variables or number values given a figure, given a word problem, or given one of the side length ratios OR given the angle measure and one side length of a right triangle, find the side length of the triangle

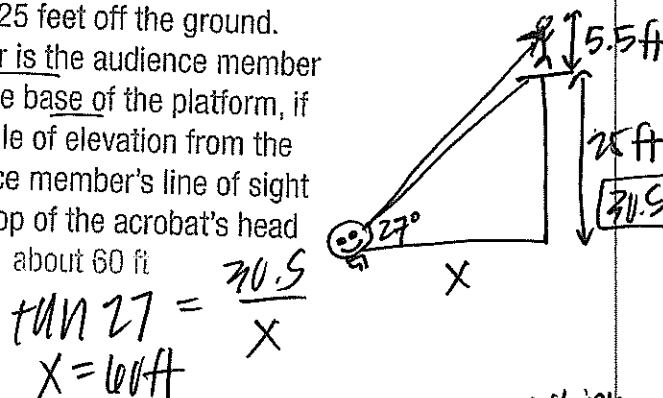
Example 2 (record in your notebook):

**EMERGENCY** A search and rescue team is airlifting people from the scene of a boating accident when they observe another person in need of help. If the angle of depression to this other person is  $42^\circ$  and the helicopter is 18 feet above the water, what is the horizontal distance from the rescuers to this person to the nearest foot?

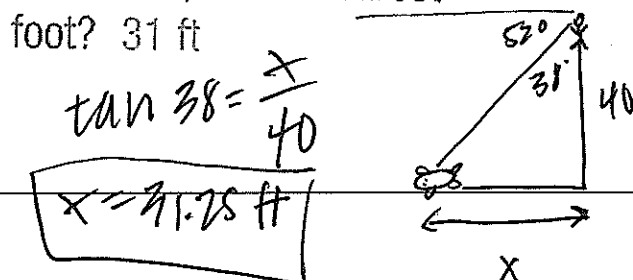
- 1)  
**LIFEGUARDING** A lifeguard is watching a beach from a line of sight 6 feet above the ground. She sees a swimmer at an angle of depression of  $8^\circ$ . How far away from the tower is the swimmer? about 43 ft



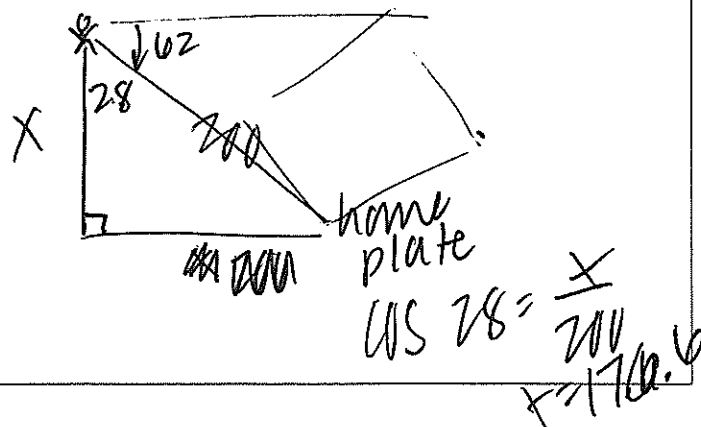
- 2  
**CIRCUS ACTS** At the circus, a person in the audience at ground level watches the high-wire routine. A 5-foot-6-inch tall acrobat is standing on a platform that is 25 feet off the ground. How far is the audience member from the base of the platform, if the angle of elevation from the audience member's line of sight to the top of the acrobat's head is  $27^\circ$ ? about 60 ft



- 3)  
**DISTANCE** Maria is at the top of a cliff and sees a seal in the water. If the cliff is 40 feet above the water and the angle of depression is  $52^\circ$ , what is the horizontal distance from the seal to the cliff, to the nearest foot? 31 ft



- 4)  
**BASEBALL** A fan is seated in the upper deck of a stadium 200 feet away from home plate. If the angle of depression to the field is  $62^\circ$ , at what height is the fan sitting? 176.6 ft



# What will Trig look like on the ACT?

1) In the figure below,  $\triangle ABC$  is a right triangle with a right angle at C. Which of the statements about this figure is NOT correct?

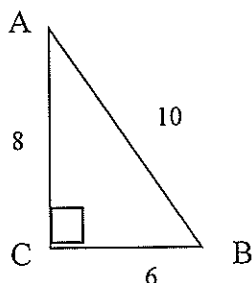
A.  ~~$\sin A = \frac{6}{10}$~~

B.  ~~$\cos A = \frac{8}{10}$~~

C.  $\cos B = \frac{8}{10}$  ✓

D.  ~~$\tan A = \frac{6}{8}$~~

E.  ~~$\tan B = \frac{8}{6}$~~

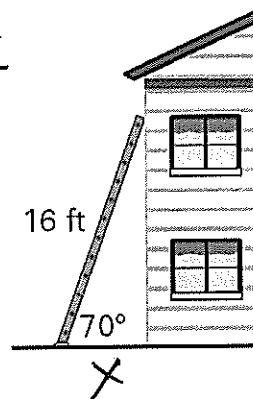


2) You lean a 16 foot ladder against the wall. If the ladder makes an angle of  $70^\circ$  with the ground, how far away from the wall is the base of the ladder? Round your answer to the nearest tenth of a foot.

- A. 46.8 feet
- B. 44.0 feet
- C. 17.0 feet
- D. 15.0 feet
- E. 5.5 feet

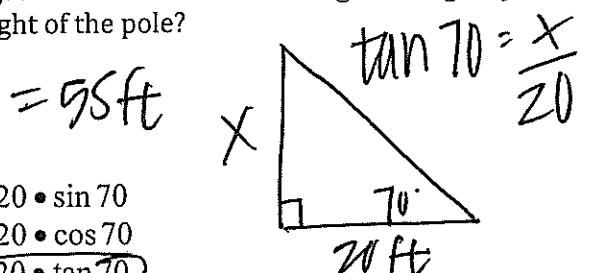
Use  $70 = \frac{x}{16}$

$x = 5.47$



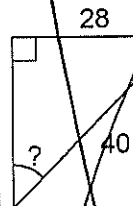
3) The shadow of a telephone pole is 20 feet long. You measure the angle of elevation from the end of the shadow to the top of the telephone pole to be  $70^\circ$  degrees. Which of the following would give you the height of the pole?

- A.  $20 \cdot \sin 70$
- B.  $20 \cdot \cos 70$
- C.  $20 \cdot \tan 70$
- D.  $70 \cdot \sin 20$
- E.  $70 \cdot \tan 20$



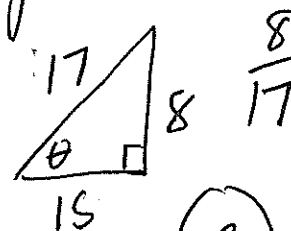
$x = 20 \cdot \tan 70$

4) Find the measure of the indicated angle rounded to the nearest whole degree.



- A.  $35^\circ$
- B.  $44^\circ$
- C.  $46^\circ$
- D.  $55^\circ$
- E. None of the above

manage

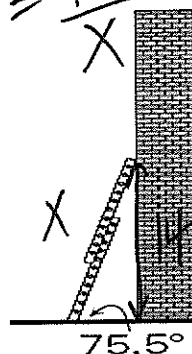


(B)

5) You have an extension ladder that you are using to repair a chimney. Which of the following is a trig ratio that could be used to find the length required for the extension ladder to reach a height of 14 ft for the chimney?

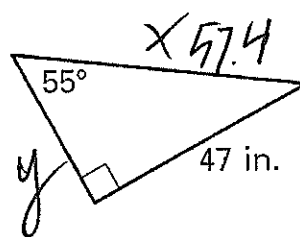
- A.  $\frac{14}{\sin 75.5}$
- B.  $\frac{14}{\cos 75.5}$
- C.  $14 \cdot \sin 75.5$
- D.  $14 \cdot \cos 75.5$
- E.  $\frac{75.5}{\sin 14}$

$\sin 75.5 = \frac{14}{x}$



$x = \frac{14}{\sin 75.5}$

6) Find the perimeter of the triangle. Round to the nearest tenth.



$\sin 55 = \frac{47}{x}$

$x = 57.4$

$\tan 55 = \frac{47}{y}$

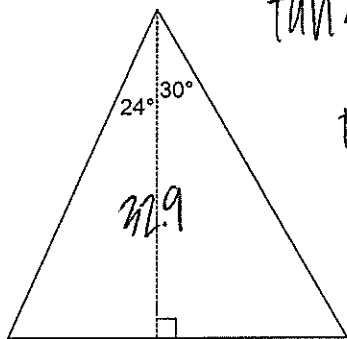
$32.9$

- A. 37.9 in
- B. 57.4 in
- C. 137.3 in
- D. 161.8 in
- E. 186.3 in

$47 + 32.9 + 57.4$

→ the largest Δ.

7) Find the area of each triangle. Round intermediate values to the nearest tenth. Use the rounded values to calculate the next value. Round your final answer to the nearest tenth.



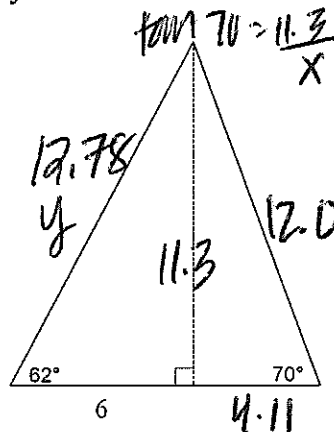
$$\tan 30 = \frac{19}{x}$$

$$\tan 24 = \frac{x}{32.9}$$

$$x = 14.05$$

$$14.05 + 19 = \frac{1}{2}(33.05)(32.9) = 533.51$$

8) Find the perimeter of the larger triangle. Round intermediate values to the nearest tenth. Use the rounded values to calculate the next value. Round your final answer to the nearest tenth.



$$\tan 70 = \frac{11.3}{x}$$

$$\tan 62 = \frac{x}{6}$$

$$x = 11.3$$

$$\cos 62 = \frac{6}{y}$$

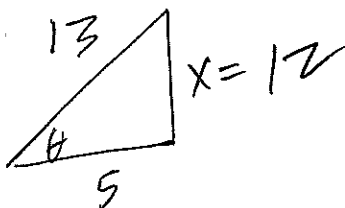
$$y = 12.78$$

$$\sin 70 = \frac{11.3}{x}$$

$$x = 12.6$$

$$P = 34.9$$

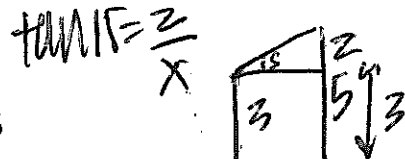
9) If in a right triangle  $\tan \theta = \frac{x}{5}$  and  $\sin \theta = \frac{x}{13}$ , then  $x = ?$



- A. 1
- B. 7
- C. 12
- D. 144
- E. Cannot be determined from given information

10) Two vertical poles, one 3 meters tall and the other 5 meters tall, stand a certain distance apart. A line from the top of the shorter pole to the top of the taller pole makes a  $15^\circ$  angle with a horizontal line. Which of the following expresses the horizontal distance, in meters, between the bases of the two poles (rounded to the nearest hundredth)?

- A. 0.54
- B. -7.46
- C. 1.34
- D. 0.13
- E. 7.46

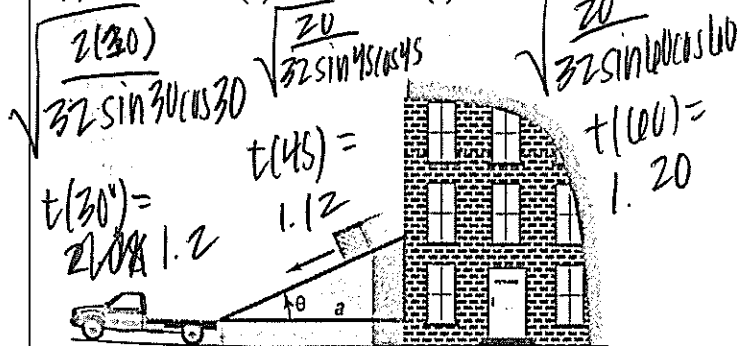


11) **Inclined Plane** See the illustration. If friction is ignored, the time  $t$  (in seconds) required for a block to slide down an inclined plane is modeled by the function

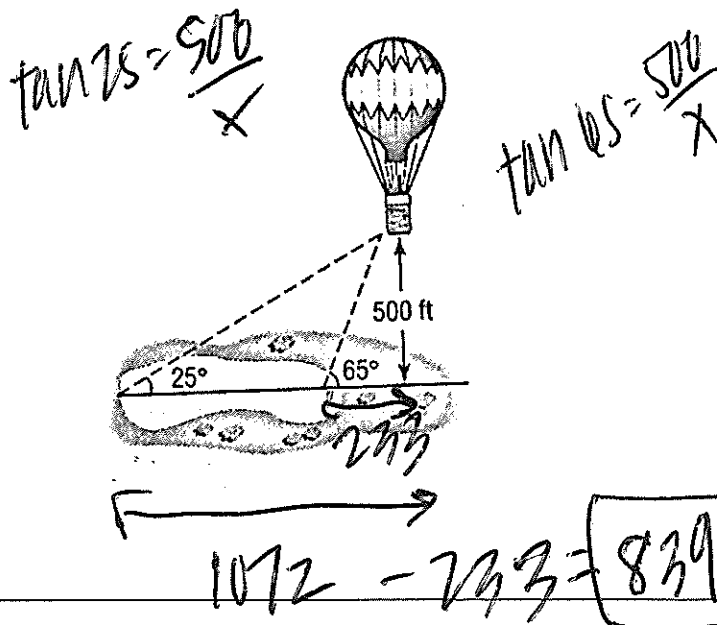
$$t(\theta) = \sqrt{\frac{2a}{g \sin \theta \cos \theta}}$$

where  $a$  is the length (in feet) of the base and  $g \approx 32$  feet per second per second is the acceleration due to gravity. How long does it take a block to slide down an inclined plane with base  $a = 10$  feet when

- (a)  $\theta = 30^\circ$ ?
- (b)  $\theta = 45^\circ$ ?
- (c)  $\theta = 60^\circ$ ?



12) Measuring the Length of a Lake From a stationary hot-air balloon 500 ft above the ground, two sightings of a lake are made (see figure). How long is the lake?



13) A person in a small boat approximately 173 ft. offshore from a vertical cliff known to be 100 ft. is looking up. If his line of sight is directed at the top of the cliff, at what angle is his head tilted?

14) **Mt. Rushmore** To measure the height of Lincoln's caricature on Mt. Rushmore, two sightings 800 feet from the base of the mountain are taken. If the angle of elevation to the bottom of Lincoln's face is  $32^\circ$  and the angle of elevation to the top is  $35^\circ$ , what is the height of Lincoln's face?

15) A right triangle has a hypotenuse of length 10 centimeters. If one angle is  $40^\circ$ , find the length of each leg.

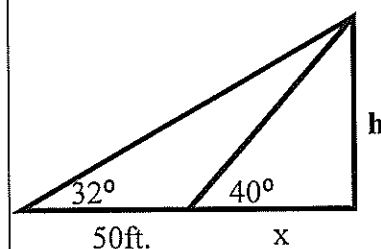
16) A right triangle contains a  $25^\circ$  angle. If one leg is of length 5 inches, what is the length of the hypotenuse? There are two answers. How is this possible?

17) A hockey player takes a shot at a distance of 20 feet from a 5 foot tall goal. If the puck travels at a 15 degree angle of elevation toward the center of the goal, will the player score?

18) **Finding the Length of a Guy Wire** A radio transmission tower is 200 feet high. How long should a guy wire be if it is to be attached to the tower 10 feet from the top and is to make an angle of  $45^\circ$  with the ground?

19) Hakeem is on a tour bus in Paris. He sees L'arc de Triomphe at an angle of 34 degrees, If the arc is 162 feet tall, how far away is the bus? Round to the nearest tenth.

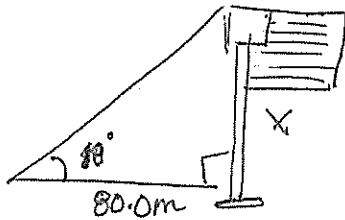
20) To measure the height of a building, two sightings are taken a distance of 50 ft apart. If the first angle of elevation is  $40^\circ$  and the second is  $32^\circ$ , what is the height of the building?





Solve the following word problems. For each question, draw a diagram to help you.

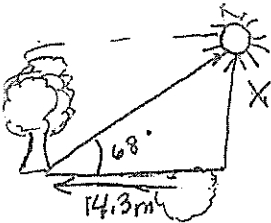
- 9) From a horizontal distance of 80.0 m, the angle of elevation to the top of a flagpole is  $18^\circ$ . Calculate the height of the flagpole to the nearest tenth of a meter.



$$\frac{\text{opp}}{\text{adj}} \quad \tan 18 = \frac{X}{80}$$

$$80 \tan 18 = X = 25.99 \approx \boxed{26.0 \text{ m}}$$

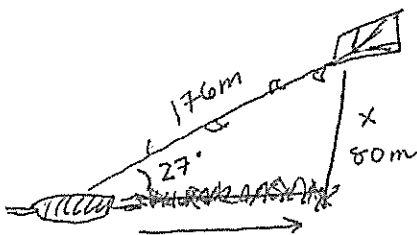
- 10) The angle of elevation of the sun is  $68^\circ$  when a tree casts a shadow 14.3 m long. How tall is the tree, to the nearest tenth of a meter?



$$\tan(68) = \frac{X}{14.3}$$

$$14.3 (\tan(68)) = \boxed{35.4 \text{ m}}$$

- 11) A person flying a kite has released 176 m of string. The string makes an angle of  $27^\circ$  with the ground. How high is the kite? How far away is the kite horizontally? Answer to the nearest meter.

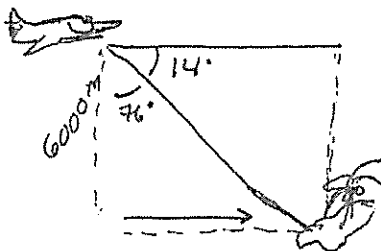


$$\sin(27^\circ) = \frac{X}{176} \approx 79.9 = \boxed{80 \text{ m high}}$$

How far away is the kite?  $\tan(27) = \frac{80}{X}$

$$X = \boxed{157 \text{ m away}}$$

- 12) An airplane is flying at an altitude of 6000 m over the ocean directly toward a coastline. At a certain time, the angle of depression to the coastline from the airplane is  $14^\circ$ . How much farther (to the nearest kilometer) does the airplane have to fly before it is directly above the coastline?



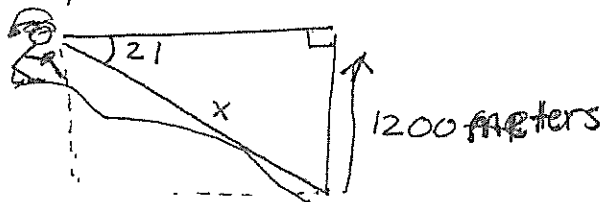
$$\tan(76^\circ) = \frac{X}{6000 \text{ m}}$$

$$6000 \tan(76) = 24064 \text{ m}$$

$$24064 \text{ m} = \boxed{24.0 \text{ km}}$$

$$1000 \text{ m} = 1 \text{ km}$$

- 13) You are skiing on a mountain with an altitude of 1200 meters. The angle of depression is  $21^\circ$ . About how far do you ski down the mountain?



$$\sin(21) = \frac{1200 \text{ m}}{X}$$

$$X = \frac{1200 \text{ m}}{\sin(21)}$$

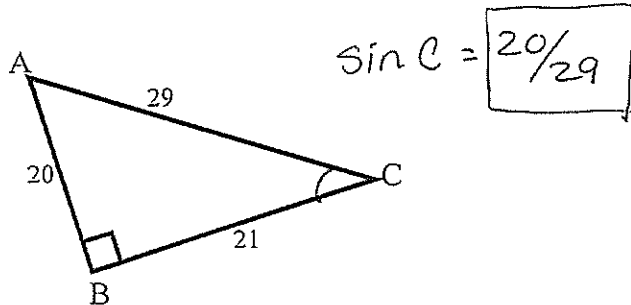
$$\approx 3348.2 = \boxed{3348 \text{ meters down}}$$

Name: Key C TP: 163

Failure to show all work and DIAGRAMS will result in a LaSalle.

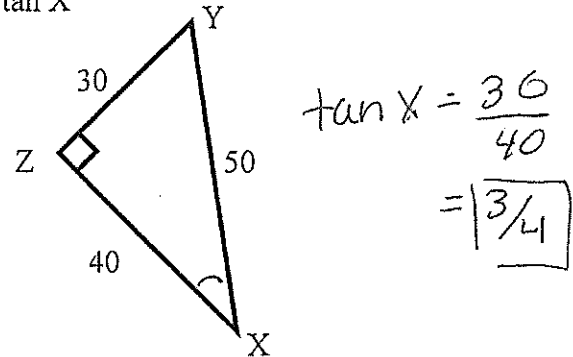
Find the value of each trigonometric ratio and express your answer as a fraction in lowest terms.

1)  $\sin C$

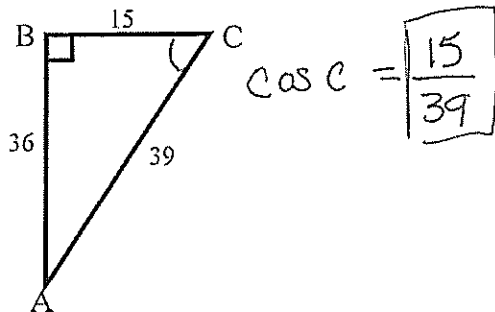


SOH

2)  $\tan X$

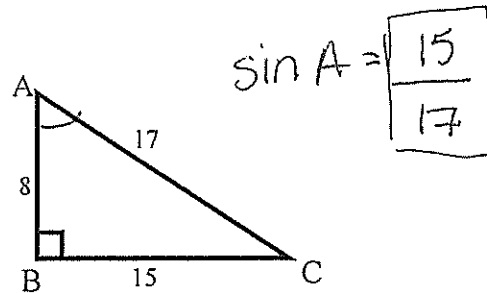


3)  $\cos C$

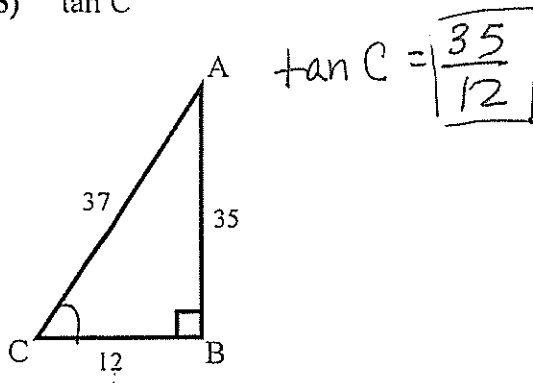


CAH

4)  $\sin A$

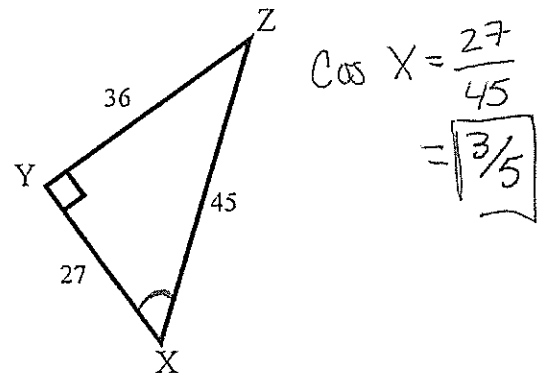


5)  $\tan C$

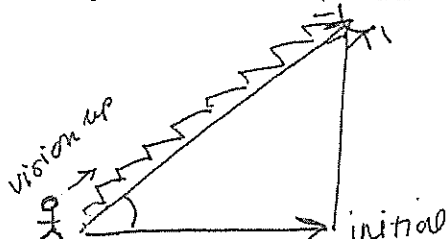


TOA

6)  $\cos X$



7) Draw a picture that shows the angle of elevation.



8) Draw a picture that shows the angle of depression.

